

REMARKS

Applicants respectfully acknowledge with appreciation the examiner's recognition that the amendment submitted to the Patent Office on November 6, 2002 was sufficient to overcome the anticipation rejection, which was based on Beilstein, thereby requiring further action based on obviousness. In the Final office action, the examiner has now combined the teachings of the Beilstein, Jr. et al Patent 5,426,566 with those of the Solomon Patent 4,992,908.

To facilitate the flow of this amendment, the examiner's rejections are set out in bold type, single spaced, followed by the applicants' rebuttal.

Claims 1-4, 8-10, and 27-28 are rejected under 35 U.S. C. 103(a) as being unpatentable over Beilstein, Jr. (reference cited by applicant) in view of Solomon (U. S. Patent 4,992,908).

As to claims 1 and 27, Beilstein discloses an electronic sub assembly (30-figure 2, column 4, line 22) as shown in figures 2-5 comprising

a circuitized laminated substrate (module 32, column 4, line 23) having top and bottom surfaces (19, 17-figure 2, column 4, line 29), and at least one edge surface (21; 33, column 4, line 29, and column 6, line 37) between said top and bottom surfaces,

at least one active or passive device (52; 70, column 5, line 10) mounted on said at least one edge surface, at least one another active or passive devices (42, 38-figure 2) mounted on at least one of the top and bottom surfaces (19, 17),

a conductive lead (37-figure 3) embedded in the substrate (32) electrically connected to another active or passive device (70-figure 3) mounted on said at least one edge surface (33-figure 3), the conductive lead also electrically connected to the at least one device on the top or bottom surface.

Beilstein does not disclose the edge surface between the top and bottom surfaces, which is beveled, at an angle between 30-60 degrees.

Solomon teaches a contact board (13, column 3, line 39) having a beveled edge (17, column 3, line 40) between top and bottom surfaces disclosed in figures 1-15.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have substrate including beveled edge at an angle of 30-60 degrees between top and bottom surfaces as taught by Solomon to employ the electronic sub-assembly of Beilstein in order to provide facilitate precisely mating contact of module to module and also save space for the design.

Claim 1 is distinguished from the structure of Beilstein in that the edge surface of the claimed sub assembly is beveled (i.e. not at right angles) to the planar surfaces. This feature yields a significant increase in the amount of edge surface area that is available for contact with active or passive devices or with other sub assemblies.

As articulated in the past amendment, the reference does not clearly disclose a "conductive lead also electrically connected to at least one device on the top or bottom surface." The conductive lead 37 that the examiner highlights is no more than a connect pad in the form of a solder bump (column 6, lines 35-36) that is on the end surface of the laminate, not "embedded in the substrate..." as specified in applicants' claim 1.

Applicants respectfully submit that the lack of specificity in the Beilstein patent is not overcome by the teachings of Solomon. This patent describes the joining together of an integrated circuit orthogonally to a contact board. These two components are joined along an angular surface that is defined by the orientation of the crystal lattice of the silicon from which the contact pad is fabricated. The angle is achieved by anisotropically etching the contact board at a specified angle as determined by the microcrystalline lattice structure of the silicon.

Also, of significance in Solomon is that the top and bottom edges of the integrated circuit are not shown as having any electrical connection to the edges of the circuit. Thus, neither he nor Beilstein shows this feature of claim 1 of

"..., a conductive lead embedded in the substrate electrically connected to an active or passive device mounted on said at least one edge surface, the conductive lead also electrically connected to at least one device on the top or bottom surface."

Accordingly, applicants respectfully submit that the combined teachings of these two patents do not show that the present invention, as now claimed in claim 1, is obvious. To hold otherwise is to engage in the practice of hindsight, a practice that is disallowed by decisions such as W. L Gore & Associates, Inc. v Garlock Inc., 220 USPQ 303, 312-313 (Fed. Cir 1983) which states at pages 312-313 as follows:

"To imbue one of ordinary skill in the art with knowledge of the invention...when no prior art reference or references of record convey or suggest that knowledge is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher."

Furthermore, there must be some suggestion in the references leading to a modification that would point to the claimed invention. Again, that suggestion or modification does not appear in the references applied in this final rejection. Solomon does not provide any suggestion whatsoever that the use of a beveled edge of a laminated circuit board would allow for the higher density of active or passive devices to be joined to the edge of a sub assembly. Without such a teaching, the rejection based on obviousness lacks a supportable basis and should be withdrawn. It is not enough that one may modify a reference in view of a second reference, but rather it is required that the second reference suggest modification of the first reference. It must do more than merely provide the capability of modifying the first reference.

The law is quite clear that in order for a claimed invention to be rejected on obviousness, the prior art must suggest the modifications sought to be patented; In re Gordon, 221 U.S.P.Q. 1125, 1127 (CAFC 1984); ACS Hospital System, Inc. v. Montefiore Hospital, 221 U.S.P.Q. 929, 933 (CAFC 1984). The foregoing principle of law has been followed in Aqua-Aerobic Systems, Inc. v. Richards of Rockford, Inc., 1 U.S.P.Q. 2d, 1945 (D.C. Illinois 1986). In the Aqua-Aerobic's case, the Court stated that the fact that a prior reference can be modified to show the claimed invention does not make the modification obvious unless the prior reference suggests the desirability of the modification. The CAFC in the case of In re Gorman, 18 U.S.P.Q. 2d (CAFC 1991), held at page 1888:

"When it is necessary to select elements of various teachings in order to form the claimed invention, we ascertain whether there is any suggestion or motivation in the prior art to make the selection made by the applicant [citation omitted]. 'Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination [citations omitted]. . . . The references themselves must provide some teaching whereby the applicant's combination would have been obvious."

Further, the CAFC, in In Re Oetiker, 24 U.S.P.Q. 2nd 1443, 1445 (CAFC 1992) held:

There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination. That knowledge can not come from the applicant's invention itself.

Most significantly, the CAFC in the recent case of In Re Dembiczak, 50 U.S.P.Q.2nd 1614 (CAFC 1999), held at 1617:

...(examiner can satisfy burden of obviousness in light of combination 'only by showing some objective teaching [leading to the combination]');

Thus, it is clear that where an individual reference does not teach the entire invention, then the modification which the invention represents must be suggested and motivated by some other reference through some objective teaching and cannot come from the application itself. Applicants respectfully submit that these requirements have not been met by the examiner.

Claim 27 depends from claim 1 and, for the same reasons as claim 1, should be deemed to be allowable. Furthermore, it should be pointed out that Solomon does not discuss a randomly selected angle for the bevel, but instead is restricted to the angle that is determined by the crystal lattice structure of the silicon that is used, typically 54°. Applicants are not limited in the practice of their invention with such a limitation. This teaching of etching along the boundary of the crystal lattice cannot be characterized as a generalized teaching of merely cutting or slicing of a laminate at a beveled angle between 30° and 60°.

As to claim 2, Beilstein discloses the electronic sub assembly (30) as shown in figures 2-5 wherein each of the active or passive devices is selected from the group including chips (38, 42).

Claim 2 describes preferred types of devices that are adapted to be mounted to the planar surfaces or the edge surfaces of the sub assembly. Applicants respectfully submit that claim 1 is not rendered obvious by Beilstein in view of Solomon. Accordingly, claim 2 should likewise be deemed to be patentably distinct over these same references.

As to claim 3, Beilstein discloses the electronic sub assembly as shown in figures 2-5 further including an electrically conductive via (via 40, column 4, line 51, and via 44, column 5, line 2) extending into the substrate from each device (38, 42) on the top or bottom surface (10, 17) into contact with a conductive lead connected to an edge mounted device.

The applicants have twice refuted the examiner's contention that Beilstein shows a conductive via extending from a device on the top or bottom surface into contact with a conductive lead connected to an edge mounted device. As previously noted, this is not the case. There is no such disclosure in Beilstein. Instead, the word "via" as it appears in line 50 of column 4 and in line 2 of column 5 of Beilstein has been taken out of context. The patent uses the word "via" at these two locations in the specification as a propositional substitute for the phrase "by means of". The word is not being used as a noun at these two locations to refer to a conductive passageway through the laminate. Accordingly, the rejection of claim 3 is erroneously predicated on a misconstruction of the language in the prior art and should be withdrawn.

Furthermore, inasmuch as claim 3 depends from claim 1, applicants believe it to be allowable. The subject matter of dependent claim 3 should likewise be deemed to be allowable.

As to claim 4, Beilstein discloses the electronic sub assembly (30) as shown in figures 2-5 wherein the laminated substrate is selected from the group comprising: a single or multiple laminates of a ceramic module and a conductive layer.

Claim 4 depends from claim 1 and should be considered as allowable for the same reasons as the independent claim from which it depends.

As to claim 8, Beilstein discloses a printed circuit board (32) as shown in figures 2-5 having two spaced apart, generally parallel surfaces comprising

a top surface (19) and a bottom surface (17), an edge surface (21; 33) between said top and bottom surfaces,

a plurality of conductive leads (37-figure 3) embedded in the circuit board (30) parallel to the top and bottom surfaces (see figure 4-5) and terminating in one or more connection points, along the edge surface (33),

an active or passive device (52; 70) mounted on said edge surface and electrically joined through at least one of said connection points to at least one of the conductive leads, and at least another active or passive devices (38, 42) mounted on the top or bottom surface electrically joined to the edge mounted device.

Beilstein does not disclose the edge surface between the top and bottom surfaces, which is beveled at an angle between 30-60 degrees.

Solomon teaches a contact board (13, column 3, line 39) having a beveled edge (17, column 3, line 40) between top and bottom surfaces disclosed in figures 1-15.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have substrate including beveled edge at an angle of 30-60 degrees between top and bottom surfaces as taught by Solomon to employ the electronic sub-assembly of Beilstein in order to provide facilitate precisely mating contact of module to module and also save space for the design.

Claim 8 relates to a printed circuit board having the basic structure as the electronic sub assembly specified in claim 1. Contrary to the contention of the examiner, the Beilstein reference does not clearly disclose a "plurality of conductive leads embedded in the PCB terminating in one or more connection points along the edge surface" as noted in claim 8. As noted above in connection with the discussion of claim 1, the conductive lead 37 that the examiner highlights is a connect pad in the form of a solder bump (column 6, lines 35-36) that is on the end surface of the laminate. It is not "embedded in the circuit board..." as specified in applicants' claim 8. Furthermore, Beilstein does not show the devices mounted on the planar surfaces being electrically joined to the edge mounted devices. Therefore, claim 8 should be deemed to be allowable.

Furthermore, applicants have distinguished the teachings of claim 1 over the combination of Beilstein in view of Solomon. Because of the similarity of claim language between claims 1 and 8, the same factors that point to the lack of obviousness of claim 1 likewise are applicable to claim 8. Accordingly, claim 8 is also patentable over this combination of references under §103.

As to claim 9, Beilstein discloses the printed circuit board (32) further including a via (36) on the top or bottom surface, and coupled to a top or bottom mounted device (see an interconnection of figure 2), said via extending into the substrate into contact with a conductive lead connected to said edge mounted device.

Applicants respectfully submit that the subject matter of claim 9 distinguishes over the combined teachings of Beilstein and Solomon. Accordingly, this claim, along with claim 8 from which it depends, should be allowed.

As to claim 10, Beilstein discloses the printed circuit board (32) wherein each said another active or passive device is selected from the group including chips.

Claim 10 depends from claim 8 and should be deemed to be allowable for the same reasons as claim 2, *supra*.

Claim 28 depends from claim 8 and, for the same reasons as stated for claims 1 and 8, should be deemed to be allowable. Furthermore, it should be pointed out that Solomon does not discuss a randomly selected angle of the bevel, but instead is restricted to the angle that is determined by the crystal lattice structure of the silicon that is used, typically 54°.

Applicants respectfully submit that independent claim 1 as amended and claim 8 clearly differentiate over the combined teachings of Beilstein and Solomon and should be allowed.

Accordingly, the examiner is respectfully requested to reconsider and withdraw the final rejection and to allow the application.

Respectfully submitted,

Date:

Mar. 7, 2003 

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